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THE SOLARIZATION OF DRY PLATES.*

R. ED. LIESEGANG.

IF a number of dry plates are compared from the glass or reverse side, it will be found that while upon some plates it is possible to see a positive image when they are laid upon a black ground, others again show no sign of any image.

Both sorts of negative when viewed from the film side show an equally black surface, yet the former variety when viewed from the glass side show a strata of white color, while the others are equally black on both sides.

This light strata is caused by a certain amount of argentic bromide which has not been fixed out, and forms a distinct layer between the reduced silver and the glass.

It is only fully exposed plates that show this apparent excess of argentic bromide. Under-exposed plates are entirely free from this condition. In the case of a normal or even exposure, the white layer appears only in the darkest portions (highest lights). Thus in a landscape it is present in the sky.

The explanation of this condition is that the plate has not been thoroughly fixed in those portions showing any trace of argentic bromide, nor would it have disappeared if the action of the fixing bath were prolonged.

*Free Translation for AMERICAN JOURNAL OF PHOTOGRAPHY, by J. F. Sachse.

The above phenomenon shows itself in negatives developed with hydrochinone or amidol as frequently as when pyrogallic acid is used, consequently it is not dependent upon any tannic action upon the gelatine film.

Upon previous occasions* it has been shown, that a dry plate upon which a film of metallic silver forms during development, is very difficult to fix, a certain amount of argentic bromide always remaining undissolved, and it is only after clearing the resultant red fog by means of cupric bromide and a subsequent refixing in hypo that it disappears entirely.

Where plates are fogged the thin film of silver retards the process of fixation. It is more than probable that the first noted condition arises from the same source, in so far that the silver reduced by the action of the light and developer prevents the penetration of the fixing solution.

Above explanation is founded upon the fact that at the points where the very dense and light portions of the negative meet the argentic bromide disappears under the dense part, for about a millimeter. Consequently the positive as seen from the reverse side is a trifle smaller than the negative as seen by transmitted light. Thus it will be apparent that the hyposulphite here has not penetrated from the top but from the sides. (*Photo. Archiv*, 1895, p. 158).

The fact that under given conditions a certain amount of argentic bromide remains in the film, is in itself a matter of little consequence. But it furnishes us with additional knowledge as to the constitution of the finished negative, in so far as it shows us that in addition to the metal, gelatine, and the products of oxidation from the developer (*Photo Archiv*, 1875, p. 174), we have also to consider a quantity of the unreduced salts of silver. Of still greater value however are the deductions to be gathered for the physical development.

When argentic bromide remains beneath the metallic film it has evidently not been reduced by the developing agent. Further, the image does not extend through to the surface of the glass, as would be expected.

Photo-Archiv, 1896, p. 10.

Consequently it is an undoubted fact that the developer has not penetrated to the required depth in the strongly-lighted portions of the plate : the same is the case in the subsequent fixing process, as the hypo solution fails to penetrate. Upon the contrary, where a plate has been subjected to a shorter exposure the whole film is penetrated with the resultant reduction of all particles of the haloid salts.

Above facts explain the phenomena known as the solarization of dry plates, which thus far has been held to be a purely chemical result.

When any portion of a plate is greatly over-exposed the reduction is restricted the extreme upper portion or strata of the film. The inpenetrable film of metallic silver formed upon the surface, although extremely thin, prevents any further action of the developer.

The reduction of the surface proceeded too rapidly. In the other parts, which were less exposed to the action of light, the process of reduction is a slower one, and the developer has the opportunity to penetrate into the lower depths of the sensitive film. These parts consequently become stronger and are free from any argentic bromide.

The whole matter seems to depend upon the rapidity of the development. It is not to be assumed, however, as has been stated, that a prolonged exposure results in a continuous film of metallic silver, while a shorter one gives a porous one.

On an over-oxposed plate, a strong developer gives a flatter image than where a weaker solution is used. Consequently in cases of over-exposure a slow vertical development is the most advisable ; an addition of potassic bromide which retards development results in a denser negative. It may also be possible that in acting upon the surface it lessens its reducing properties, and thus by a slower formation of the metallic film upon the surface, permits a deeper penetration of the developing agent.

The increase of solarization by the addition of hypo, thiosinanim, or an excess of ammonia, seems to point to a reverse action.

This theory of solarization in developed dry plates, can neither

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be proven nor refuted by an exposure through the glass, or by stripping the film from the glass. In the first case, if overexposed the protecting film of silver forms itself upon the surface (same as with an ordinary exposure), the light having penetrated through the film with an equal force, and after fixation the negative plainly shows the presence of unreduced argentic bromide.

Where the film is stripped from the plate, an impervious stratum of metallic silver is formed upon both sides of the loosened film, and the unreduced argentic bromide remains between the two layers of metallic silver.

If we observe a negative from the reverse during the process of development, no image is seen in some cases; in others again a picture appears.

The various brands of plates show different degrees of penetration. In argentic chloride plates, a negative shows upon the reverse side much quicker than upon a highly sensitive bromide plate. This is caused by the fact that the actinic rays penetrate more deeply through the fine-grained silver chloride than through the coarser-grained argentic bromide.

However it is not the present purpose to go into this matter further than to show the mere relation of a single brand of plates, such as a normal sensitive bromo-gelatine dry plate. These observations offer an important support to the new theory of solarization.

A properly exposed plate, during development shows through after a short time upon the reverse side of the negative, or, to use a more technical expression, the negative strikes through the film, and gains density with continued development.

An underexposed plate, when enough light has acted upon it, also "strikes" through, and a reduction shows from the glass side, otherwise this remains uncolored [*i. e.*, prior to fixation.—*Trans.*].

A greatly overexposed plate after a continued development shows a strong positive. Frequently this is preceded by a negative image [upon the glass side.—*Trans.*] The latter, however, disappears as the reverse side blackens evenly: then the positive appears. An explanation of this phenomenon will form the basis of

a paper for the future. However, from what has been said the protective action of the rapidly-reduced film of silver has been fully shown.

THE RÖNTGEN RAYS.

BY PRESIDENT HENRY MORTON, PH.D.

In connection with Dr. Röntgen's discovery and the X-rays there are a number of facts long known which in some cases seem to be forgotten, and which, while in no way detracting from the originality and merit of his discovery, yet need to be considered in order that the true characteristics of his discovery should be recognized, and the mixed or uncertain character of many experiments recently made by others in attempting to repeat or extend his results clearly appreciated.

Thus, to begin with, it is not new that invisible radiations obtained by electrical discharges in Geissler tubes and elsewhere should produce photographic and fluorescent effects.

In the *American Journal of Art and Science*, 1864, vol. xxxvii., page 207, will be found a paper by Professor O. N. Rood, of Columbia College, entitled, "On the Action of Very Weak Electric Light on the Iodized Plate." From this paper I will make a few quotations:

"About three years ago Dove received from Mr. Gunther, of Berlin, a photograph of a bronze statue of an amazon holding a lance in a perpendicular position, Mr. Gunther at the same time calling his attention to a singular mark in the picture, which was not in the original.

"The lance was properly delineated on the negative plate, but in addition just at the tip a dark streak was visible, though nothing of the kind had been observed at the time of taking the picture. Careful examination of the plate showed two other analogous marks. Dove thought that these singular appearances might have been caused by the presence of invisible electric brushes resting on these points, and undertook some experiments to determine whether weak electric light could be photographed.

Geissler tubes were used in a *dark* room, and, with the aid of Gunther, he succeeded in obtaining good photographs of the stratified discharge."

Professor Rood then goes on to describe further experiments of his own made to ascertain if these faint electric lights or discharges could be photographed in a *light* room and when they were invisible to the eye. After describing some preliminary trials, he further says: "Accordingly, to make an exact experiment on this point, a sheet of white paper was placed behind one of these (Geissler) tubes, and white light reflected through it toward the camera. The intensity of this reflection was so regulated that the bright envelope of the platinum wire (in the tube) was nearly invisible, and the diffused violet light at a greater distance from the wire *absolutely* invisible. Nevertheless, an intense photographic image of the envelope and a very distinct image of the diffused electric light was easily obtained, thus proving conclusively the correctness of Dove's assumption, that electric light which in ordinary daylight could not be seen owing to its feeble illuminating power, might yet make itself very evident on the iodized plate by virtue of its high percentage of chemical rays."

The above is interesting as showing that as early as 1864 the relatively greater photographic than visual effect of the light produced in exhausted tubes (Geissler tubes) was recognized.

About the same time and thereafter, and, indeed, up to the present day, much work has been done in photographing that part of the solar spectrum which represents those vibrations which, by reason of their short wave-length, have either little effect upon the eye or none at all.

Prof. Wm. A. Miller, in London, carried this work far enough to show that he could, by the use of quartz lenses and prisms, secure a photographic spectrum from the electric light extending beyond the visible violet for a distance several times as great as separated the extreme violet from the lowest visible red at the other end of the visible spectrum. It was thus shown that *invisible* radiations of short wave-length possessed remarkable photographic power.

I will now turn to another line of observation which marks a

limitation or distinction of the Röntgen effects in another direction.

When the eye is directed toward a faintly luminous object it will either at once perceive it (under favorable conditions), or not at all. In other words, nothing will be gained by continually gazing at it.

On the contrary, the best chance of catching sight of a faint object, such as a feebly luminous comet, is to look away from the true direction and then, with some quickness, to turn the eyes toward it. In this way we can often secure a momentary impression of a dim object which we cannot perceive continuously.

With the sensitive photographic plate, however, all this is reversed.

An amount of light which, acting on a plate for one second, produces no sensible impression, will produce a strong one if its action is continued for twenty or thirty seconds, and so on up to several hours of exposure.

One of the most interesting illustrations of this has been furnished in connection with the photographing of stars, carried on at the Harvard Observatory under the Henry Draper Memorial, maintained by Mrs. Henry Draper, of New York. But the first observation of this phenomenon was made by Mr. A. A. Common (see *Astron. Soc. Monthly Notices*, 43, 1883, page 255) in connection with his beautiful photograph of the great nebula in Orion.

It was there found that besides the impressions of visible stars, on plates exposed for a long time, there were many other similar spots or images occurring time after time in the same positions on successive plates, which were due to stars too faint to be perceived by the eye, but yet capable, by prolonged action, of producing images on the sensitive plates.

We see then that the photographic plate has yet another means of *seeing in the dark*, besides that due to its power of perceiving vibrations whose wave-length is too short to affect the nerves of the retina. By its *accumulative* action or capacity of *storing up* the effects of any sort of vibrations capable of affecting it, rays too feeble to affect the eye will, in time, impress the sensitive film.

There is yet another region of observation which should be marked off in order to appreciate fully the nature of the Röntgen discovery.

When in August of 1880 Dr. A. G. Bell announced his remarkable invention of the photophone, by means of which sounds and articulate speech could be conveyed from one place to another by a pencil of light, he stated at the same time that the radiant vibrations of sunlight, by which this result was secured, were only to a moderate extent impeded by a sheet of hard rubber thick enough to shut out to the eye every trace of light, even from the concentrated rays of the sun.

It had also been noticed some time ago by others that a sheet of hard rubber was not a perfect shield for a sensitive plate if there was any considerable exposure to sunlight. See also "Photography of the Infra-red Region of the Solar Spectrum," by W. H. Pickering, Ph.D., *Proceedings American Academy of Arts and Sciences*, 1884.

Moreover, Carey Lea, of Philadelphia, more than twenty-five years ago showed that a negative plate could be so acted upon as to develop an image, on applying the usual developer, by the application of very moderate heat, and even of slight mechanical pressure. (See his *Manual of Photography*, 2d edition, 1871, page 408.

This last is of special interest in connection with Tesla's recent suggestion that the Röntgen pictures may be due to the mechanical action of the impact of particles actually driven at high velocities from the cathode pole.

While the above facts detract nothing from the originality and merit of Dr. Röntgen's real discovery, they are of use in helping us to appreciate what is its important and central characteristic, and to discriminate between the same and many of the so-called repetitions and extensions of his work with which the daily papers have been filled.

The Röntgen discovery differs from all that went before, not in the broad fact that some sort of radiation would act on sensitive plates when, by passing through certain screens or otherwise, they had become or were invisible, but in that this inves-

tigator has shown a new sort of vibrations absolutely devoid of luminous properties and yet capable of *easily* penetrating certain materials of the greatest optical opacity, such as black paper.

The experimenters who have been producing shadow photographs with sunlight, electric light, and the like, have not been repeating Röntgen's operations, but only applying facts known for fifteen or more years.

There is another part of Röntgen's work which, though followed up by some, has as yet excited much less general attention, partly, no doubt, because the materials and conditions for making experiments are less easy to secure, and also because the results are not permanent, but must be inspected while they are being produced. I allude to the developments of fluorescence and the production of shadow pictures visible on a fluorescent screen.

To make this subject clear, and also, as before, to bring out the exact novelty of Röntgen's work in this connection, I must go into the early history of the subject of fluorescence.

This was first systematically studied by Prof. Stokes, of Cambridge, England, and admirably developed in his classical paper in the *Philosophical Transactions* for 1852, Part 2, page 466 *et seq.* In this place he shows that quite a number of solid bodies and solutions possess the power of absorbing light variations of various wave-lengths and then instantly emitting them again, but always with an increase of wave-length. Thus, for example, a solution of acid sulphate and quinine will absorb the extreme violet rays of the spectrum and then emit them as bright blue rays. Again, an alcoholic solution of chlorophyl (the coloring matter of plants) will absorb yellow rays, as well as shorter ones, and emit red light.

There are many other bodies acting on and producing different rays, but in every case the emitted ray is of greater wave-length, or, as we say, lower in the spectrum than the absorbed or exciting ray.

As might naturally be expected, on this principle the extremely short wave-length of rays above the visible violet of the spectrum causes them to be absorbed by most fluorescent bodies and

emitted as rays of greater wave-length, and therefore visible; and thus in this way also was supplied a method of making invisible light of solar vibrations visible.

In fact, Stokes showed that if a solar spectrum was thrown on a block of "canary glass" (glass colored greenish-yellow by oxide of uranium) its upper end was elongated or rendered visible by the fluorescent light developed, just as it was similarly extended upward when photographed upon a sensitive plate.

Besides canary glass many other materials could be used, the most efficient being a sheet of paper coated with a paint made from finely pulverized crystals of the platino-cyanide of barium. This subject was further investigated in this special relation by Stokes and also by Miller in 1862. (See *Philosophical Transactions*, 1862).

In 1872 the present writer had the good fortune to discover in and extract from certain dense and tarry petroleum distillates a hydrocarbon, to which he gave the name of *thallene*, which possessed this property of fluorescence in a pre-eminent degree. Itself of a light lemon-yellow color, if spread as a pigment on paper it shines out with a flood of grass-green light when placed in the invisible part of the spectrum, or when there fell upon it violet or blue light.

Its peculiar properties were exhibited at a lecture on fluorescence delivered in the Academy of Music in Philadelphia in 1872, in the following manner:

A screen or curtain of muslin, about twenty feet square, of the yellow color of thallene, was prepared, and to this was attached a design of leaves, wreaths, etc., made of paper coated with thallene. Seen by gaslight this design could not even be recognized at a short distance, but when the rays of a powerful electric light sifted through a dark purple glass, which cut off all but the violet and super-violet radiations, were thrown upon it, the design fairly blazed out in vivid green on a background of muslin which looked as dark as black velvet. The yellow muslin could not reflect even any of the violet light, but the thallene turned this, as well as the super-violet invisible rays, into green light.

A full account of this material will be found, among other pub-

lications, in *The Chemical News*, of London, 1872, vol. xxvi., page 272; *The London and Edinburgh Philosophical Magazine*, 1873, vol. xlvi., page 89; and *The American Chemist*, 1873, vol. iii., pages 81 and 162.

I regret to say, however, that with the Röntgen rays thallene does not show that remarkable fluorescence which it displays with ordinary violet and actinic light.

The general subject of fluorescence is also discussed at some length by the present writer in the article under this heading in Johnson's *American Encyclopædia*.

Here, then, we see that prior to Röntgen's experiments it was well known that certain practically invisible rays could produce visible effects through the action of fluorescence.

What Röntgen has added to this is the knowledge that rays are developed in peculiar abundance in the highly exhausted tubes known as "Crookes tubes," which will penetrate with unexpected facility a great many optically opaque substances, and develop fluorescence in certain materials, the most effective of which seems to be the tungstate of calcium, as Edison has discovered.

Just what is the distinguishing character of these peculiarly actinic and fluoresogenic rays is at present a problem enshrouded in great obscurity by reason of the conflicting statements of experimenters.

Röntgen and others say that they proceed from the cathode terminal. Prof. Rowland and others say that they come from the anode. Tesla thinks that they are not vibrations of any sort, but are streams of projected material particles.

It would seem that the judicious course is to build no theories, but to extend experiments and accumulate facts. This is being done by a number of experimenters of ability and experience, among whom I may mention Prof. O. N. Rood, of Columbia College, and Prof. A. M. Mayer, of the Stevens Institute of Technology, New Jersey. Their results have not yet been made public, but are, as I understand, of a very important character, proving among other things that the new rays are incapable of polar-

ization, and, therefore, radically different from any rays of light or heat heretofore observed.

This was suggested by Röntgen, but not shown by any experimental proof.—From the *Stevens Indicator* for April, 1896.

A Curious Industry.—One of the devices for deception, in connection with the wine traffic, is called "Spider-farming." It is carried on in Germany, France and Italy, and to some extent in the United States. The value of wine increases with its age. For this reason the wine-dealers want it to appear that their wine is old. Hence they buy these insects to put into their cellars in large numbers, and in a little while these busy spinners have the bottles and wine-vats covered with cobwebs, giving the appearance of having been there a long time, thus deceiving the customers.

Take Life As It Comes.—Worry will only give you wrinkles and make you old.—There is one sin which is everywhere, and by everybody underestimated and quite too much overlooked in valuations of character. It is the sin of fretting. It is as common as air, as speech—so common that unless it rises above its usual monotone we do not even observe it. Watch an ordinary coming together of people, and we see how many minutes it will be before somebody frets—that is, makes more or less complaining statements of something or other, which most probably every one in the room or car or on the street corner knew before, and which most probably nobody can help. Why say anything about it?

It is cold; it is hot; it is wet; it is dry; somebody has broken an appointment, ill cooked a meal; stupidity or bad faith somewhere has resulted in discomfort. There are plenty of things to fret about. It is simply astonishing how much annoyance and discomfort may be found in the course of every day's living, even at the simplest, if only one keeps a sharp eye on that side of things. Even Holy Writ says we are born to trouble as the sparks fly upward.

But even to the sparks flying upward in the blackest smoke there is a blue sky above, and the less time they waste on the road the sooner they will reach it. Fretting is all time wasted on the road.

Not only does fretting worry us and those around us, but remember nothing brings the wrinkles more quickly.—*Philadelphia Times.*

THE COMING P. A. OF A. CONVENTION.

EVERY indication points to the success of the coming convention at Celeron this month. It will certainly be twice as large as any previous one, and those who miss it will surely regret it.

For the convenience of many who have requested it, and others, we republish in this issue the prize list, etc.

The territory covered by the Photographers' Association of America is divided into four divisions for the purpose of encouraging competition for prizes. Each division has a separate and independent full set of prizes to compete for among themselves. Thus, for instance, a member in the Eastern Division does not compete against a photographer in any other division than his own. The territory is divided as follows:

EASTERN DIVISION.—Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, Pennsylvania, Maryland, District of Columbia, New Jersey and the Dominion of Canada.

WESTERN DIVISION.—Washington, Oregon, Minnesota, California, Idaho, Utah, Arizona, Montana, Wyoming, Colorado, New Mexico, Nebraska, Kansas, Missouri, Indian Territory, Texas, North Dakota, South Dakota, Nevada and Oklahoma.

SOUTHERN DIVISION.—Arkansas, Louisiana, Mississippi, Alabama, Virginia, West Virginia, Delaware, Tennessee, Kentucky, North Carolina, South Carolina, Florida and Georgia.

MIDDLE DIVISION.—Wisconsin, Iowa, Michigan, Illinois, Indiana and Ohio.

LIST OF PRIZES.

GENRE CLASS—3 pictures, 13 ins. or larger, on any matt surface paper, subject to be chosen by the photographer; the title to be appropriately inscribed on each picture. To be framed at the discretion of the exhibitor, with or without glass. One gold medal.

CLASS A—24 pictures, 6 pictures to be 16 inches or larger; one gold medal, first; one silver medal, second; one bronze medal, third; and one diploma, fourth.

CLASS B—6 pictures, 13 inches or larger; one gold medal, first; one silver medal, second; one bronze medal, third; and one diploma, fourth.

CLASS C—24 pictures, 10 inches or smaller; one silver medal, first; one bronze medal, second; and one diploma, third.

CLASS D—A rating competition—12 cabinets only. First prize, one silver medal; and to all receiving 21 points or over, a bronze medal.

CLASS E—Landscape with or without figures; marine views or interiors, six pictures, 13 inches or larger; one silver medal, first; one bronze medal, second; and one diploma, third.

CLASS F—Landscape, with or without figures; marine views or interiors, 12 pictures, 10 inches or smaller; one silver medal, first; one bronze medal, second; and one diploma, third.

CLASS G—Combination pictures—3 combination prints, sizes to be left to discretion of the photographer; one silver medal, first; one bronze medal, second; and diploma, third.

CLASS H—Twelve Commercial pictures; one silver medal, first; one bronze medal, second; and one diploma, third.

CLASS I—Most tastefully arranged exhibit; one diploma.

CLASS J—Foreign exhibit; best collection of photographs, any size, framed or unframed, to be delivered to the Association free of charge; one gold medal, first; one silver medal, second; one bronze medal, third; and one diploma, fourth.

GRAND PRIZES.—The winners of the first prize in CLASS A in each of the divisions will be put in competition against *each other* for a *grand prize*, and the four first prize winners in the GENRE CLASS in the four divisions will also compete against each other for a *grand* prize. The grand prize in Class A being a beautiful Silver Loving Cup. The grand prize in the Genre Class being a

magnificent piece of bronze statuary; thus the winner of the grand prize in either of these classes carries off two prizes with the one exhibit. Three judges especially appointed by the Executive Committee will pass upon these grand prize exhibits.

APPOINTMENT OF JUDGES.

1. Three judges to be appointed from *each division* by the Executive Committee, and their identity to remain unknown until after the awards are made.

2. Three judges to be appointed for the "Grand Genre," the "Grand Portrait Awards," the Foreign, and "most tastefully arranged exhibit;" by the Executive Committee.

RULES AND REGULATIONS.

1. All competitors must be members of the Association.

2. Exhibitors cannot compete in more than one of the following classes: A, B, C, or D. All photographs for Association prizes must be made from negatives taken since the last convention.

3. One dimension given applies to extreme length or breadth of pictures in all classes. This rule applies to the size of the print and not the mount.

4. Should any exhibitor or exhibitors use his or their influence in any way, directly or indirectly, with the judges during their term of office in favor of any exhibit, it shall be the duty of the judges to strike their exhibit or exhibits from the list. All exhibits must be framed, with or without glass. The committee suggests a one-inch oak frame.

5. Ten marks to be the highest given for any one point, consequently thirty points is the highest that can be given to any one picture. In the Genre class ten points of the possible thirty are to be marked on *originality*.

6. All exhibits must reach Jamestown, N. Y., in care of P. A. of A., by June 15.

7. Entries for art department to close positively June 10. No space will be allotted after that day. Applications for space in

this department must be made to Geo. T. Bassett, No. 40 N. Illinois street, Indianapolis, Ind.

8. All art exhibits must be sent to Geo. Steckel, First Vice-President P. A. of A., Jamestown, N. Y., and all charges prepaid.

9. Exhibits for stock department to be shipped to J. Will. Kellmer, Secretary of P. A. of A. (charges prepaid), Jamestown, N. Y., and must be placed in position by 10 A. M. June 22.

10. Have your box covers screwed instead of nailed; put your home address on under side of cover for return of pictures; put screw eyes and picture wire in box, and ship your exhibits early.

11. All boxes and packages will be accepted at any time previous to the convention, so that photographers need not feel any uncertainty about the safety of their goods. No exhibits will be allowed to be removed from the hall until the close of the convention.

12. All these rules and regulations will be strictly adhered to.

The exhibits winning the grand prize in the Genre and A classes to become the property of the Association, for the purpose of forming a permanent exhibit.

RAILROAD RATES.

The railroads have given the P. A. of A. of '96 unprecedented rates as follows: West of Pittsburgh and Buffalo one fare for the round trip. East of Buffalo and Pittsburgh one fare and one third.

The regular fare east of Buffalo and Pittsburgh is much less per mile than west of these points, so that one and one-third east is as good a rate per mile on the average as one fare west.

East of Buffalo and Pittsburgh every passenger must secure a certificate at the time of purchasing his or her ticket from the ticket agent in order to secure the reduction. For instance, in New York full fare of $9.00 for one way is paid at the time of purchasing a ticket and the certificate entitles you to return for $3.00, or $12.00 for round trip.

West of Pittsburgh and Buffalo certificates are not necessary, a special ticket being given for the round trip, but these tickets

CHILD STUDY.

FROM GUTEKUNST GALLERIES,
BROAD AND COLUMBIA AVE., PHILA.

will be on sale only for two days, June 21st and 22nd, good to return anytime before June 30th.

Important to remember.—If you live east of Buffalo and Pittsburgh be sure and secure a certificate on purchasing your ticket. Be sure and secure your ticket on Saturday if you leave on Sunday, as no certificates are issued Sunday at railroad offices.

If you live west of Buffalo and Pittsburgh be sure you leave on either Sunday or Monday, June 21st or 22nd, as these are the only days on which one-fare-rate tickets are sold.

Special parties are organizing to leave from all the important cities. Look this up and join one of these parties as these trains will have special through cars without change and it will be more comfortable and agreeable than traveling by yourself.

The following are the rates from some of the principal cities. Special trains will leave from nearly all of them. Inquire about them.

FROM	RATE ROUND TRIP.	BASIS FOR RATE.
Boston,	$14.20	Fare and a third on certificate plan.
Providence,	14.20	" " "
Albany,	9.53	" " "
New York,	12.00	" " "
Philadelphia,	13.07	" " "
Baltimore,	15.20	" " "
Washington,	16.80	" " "
Toronto,	5.55	" " "
Buffalo,	2.75	regular excursion rate.
Pittsburgh,	7.00	" "
Cleveland,	4.25	one fare.
Columbus,	8.40	"
Cincinnati,	11.00	"
Dayton,	9.80	"
Louisville,	11.58	"
Detroit,	6.75	"
Grand Rapids,	11.58	"
Chicago,	12.00	"
Indianapolis,	12.48	"
St. Louis,	17.75	"

HOTELS.

The large summer hotels have given a rate of $3.50 per day, smaller hotels and cottages, $1.50 to $2.00 per day. The principal hotels are located at Lakewood and Greenhurst.

If you have not secured rooms write immediately to C. E. Snow, Jamestown, N. Y., Chairman Hotel Committee.

Tell him how many rooms you desire, the number in party, and the rate you desire to pay. He will locate you as near as possible in conformity to your wishes and notify you where to go before leaving home.

ENTERTAINMENT.

All of the committee on entertainment have reported fine progress and the proposed three evenings entertainment given by manufacturers, dealers and demonstrators are now assured successes. Each night will eclipse the other if possible.

The natural advantages and attractions of Celeron Park and Chautauqua Lake are too well known to comment upon. Without any extra entertainment these alone would satisfy and make a week's stay only too short.

EDUCATION.

A school of photography conducted every afternoon in a building especially modeled for this purpose, with modern light, and furnished with complete apparatus and accessories, with seating capacity for a large number within sight and hearing of everything that transpires under the light, will afford opportunity for practical work never before attempted at a national convention.

The officers feel gratified that their efforts with railroads and preparing entertainment and educational advantages have met with such favorable results, and are confident of satisfying every attendant.

Do not be too lavish in your praise of various members of your own family when speaking to strangers; the persons to whom you are speaking know some faults that you do not.

PHOTOGRAPHY IN NATURAL COLORS.*

THE great success that has attended the photo-mechanical processes for the automatic, though indirect, reproduction of natural colors in prints from photographic negatives, and the process of Ives for indirect reproduction by means of colored transparencies, seems for a time to have drawn attention away from the processes in which the colors, or, to be strictly accurate the color-reproducing substances, are the direct result of the action of light. This is true more especially of the old processes, such as those of Becquerel and Poitevin, and is not perhaps true to the same extent of the later process of Lippmann, whose successes must be comparatively fresh in the minds of all who have followed the development of this line of photography.

It would, however, be very unfortunate if these older processes were altogether neglected, and the possibilities of research along the same or similar lines were lost sight of, and for this reason a long memoir by Otto Wiener on "Color photography by means of colored products, and mechanical color accommodation in nature," appeared very opportunely in a recent number of the *Annalen der Physik und Chemie*. Wiener, who is Professor in the Physical Institute in the Technical High School at Aachen, is already well known to scientific photographers through the researches which he made in 1890 on the properties of "standing waves" and the effects producible by them. This investigation led him to consider minutely the fundamental principles of the reproduction of colors by the action of light, and the paper already cited is a further outcome of his work. Broadly speaking, it may be divided into four sections, which comprise—(1) An investigation of the question whether the reproduction of colors in the older processes of Seebeck, Becquerel, and Poitevin, and the newer process of Lippmann, is due in all cases to the same cause, or to two or more different causes in the different processes; (2) a description of a method of distinguishing between colors due to interference and those due to colored sub-

* C. H. B., in *Photography*.

stances; (3) a statement of the fundamental conditions that must be satisfied by any process for the direct reproduction of colors by means of colored products or pigments which result from the action of light; (4) a discussion as to how far the well known "color accommodation" of living creatures, such as caterpillars and their pupæ, is analogous to the photographic processes referred to.

It is always a great advantage when the fundamental differences between processes that at first sight seem to be similar are clearly established, and it is a great help to subsequent investigators when the essential conditions of a problem are set out in detail. It is therefore proposed to reproduce the subject matter of Wiener's paper at some length, so as to make its contents known to photographers who may not have access to the journal in which the original appeared.

When Wiener first published the results of his work on "standing waves," he was unacquainted with the fact that so long ago as 1868, Zenker in his *Lehrbuch der Photochromie* had worked out practically the same theory, and had applied it to the explanation of the processes of photography in colors known at that time. He also did not know that in 1887 Lord Rayleigh (who in his turn was not acquainted with Zenker's work) was led by his investigations on the propagation of waves to suggest a similar explanation. It is noteworthy, therefore, that throughout this paper Wiener speaks of the theory of the photographic production of interference colors through the action of standing waves as "Zenker's theory," and not as his own. At the same time, whilst there is no doubt that Zenker is entitled to the credit of having first published the theory, Wiener himself arrived at the same theory quite independently.

In 1871, soon after the publication of Zenker's book, Schultz-Sellack urged some very forcible objections against the general applicability of his theory to even the comparatively few color-photography processes known at that time. He pointed out that in powders the conditions essential to the production of regular standing waves do not exist, and yet powders may reproduce colors, for in Seebeck's earliest process the sensitive material

consists of powdered silver chloride spread on paper and exposed to light. It is also clear that the same objection will hold good in those cases where, as in Poitevin's process, paper is sensitised by immersion in various solutions, or where the sensitive material is supported by paper, but will not hold where, as in Becquerel's process, the sensitive material is uniform and transparent, and is supported on a polished metallic surface capable of acting as a mirror.

Schultz-Sellack also advanced the hypothesis that colors may be the result of alterations in the degree of mechanical sub-division of the material of the film, this being brought about by the action of light, but depending on the working activity of the rays, and not on their color, or, in other words, on the quantity of mechanical work done on the film by the light waves. Wiener discusses this point at some length, and it may be as well to dispose of it before proceeding to consider the other problems.

According to Schultz-Sellack, if a mirror of silver is deposited on glass and subsequently converted into silver iodide, the latter undergoes no chemical change when exposed to light, but is converted by the action of light into a fine powder instead of a continuous film, the alteration being mechanical. Wiener found, however, that when such a film was observed under the microscope, the diameter of the silver iodide particles is about one-thousandth of a millimetre, whilst the diameter of the spaces between them varies considerably up to three thousandths of a millimetre.

The order of the colors (viewed by transmitted light) produced by the action of sunlight on the film of silver iodide is, according to Schultz-Sellack, as follows: Yellow-brown, dark brown with considerable turbidity, red, green, blue, pale bluish-white, whilst with prolonged exposure the film becomes almost completely colorless and transparent, although slightly turbid. Wiener observed somewhat similar colors, but with the electric light the results were irregular, the same exposure producing different colors on different parts of the same film. Only the violet and ultra-violet rays are capable of producing this mechanical alteration.

Schultz-Sellack regards the colors as being produced by diffraction, mainly on the ground that they are best seen when the plate is taken into a dark room and held against the light coming in through a small aperture in the wall or window shutter. As a matter of fact, however, Wiener finds that the colors, although very dull, are seen under illumination from all directions, and they do not show any of the characteristics of diffraction colors. Another difficulty is that the colors should be seen by transmitted light only, whereas the process shows the colors by reflected light. If the colors are produced by interference, the reflected color and the transmitted color should be complementary. Wiener found that, for example, in one place the reflected light was a metallic yellow-green, whilst the transmitted light was bluish-violet.

According to Schultz-Sellack's hypothesis, the resulting colors are determined by the mechanical energy of the incident rays, and not by their color, that is, by the intensity of the action, and not by the kind of action, and he held that the color changed from red to green, and then to blue as the quantity of light action was increased, or what, under certain conditions, may come to the same thing, as the time of exposure was prolonged. Wiener found, however, that the colors seen by reflected light on a silver iodide film do not correspond with the order just indicated.

There is still another, and very conclusive, way in which the problem may be attacked. If the resulting color is determined only by the quantity of light action, and not by the wave length, that is, by the color, it follows that all the rays, whatever their color, should at first produce the same color on the sensitive surface, and with longer and longer exposure should produce in their proper order the colors corresponding to different quantities of light action. Becquerel, on the contrary, observed that the colors produced are purest, although weakest, with short exposures, and that all the colors are shown from the beginning, and not one of them only. Wiener has endeavored to confirm this observation by exposing strips of a plate prepared in Becquerel's manner to the spectrum for different lengths of time, an electric arc being employed as the source of illumination, and the plate

being contained in a small camera attached (in place of the ocular) to the observing tube of a Steinheil spectroscope. With one minute exposure there was a trace of red, the yellow and green were very faint, and the blue was wanting; with two minutes the red was strong, the yellow and green recognizable, and the blue still missing; with four minutes the red, yellow, and green were stronger, and the blue very faintly visible; with eight minutes, the red, yellow, and green were still stronger, and the blue distinct; with sixteen minutes, red, yellow, and green still more intense, but the blue remained weak; with thirty-two minutes all the colors were stronger, but retained their nature and relative positions. The action of the ultra-violet rays became evident with an exposure of two minutes, that is to say, AFTER the red rays had produced a visible effect.

(To be continued.)

SOME INTERESTING OPTICAL ILLUSIONS.

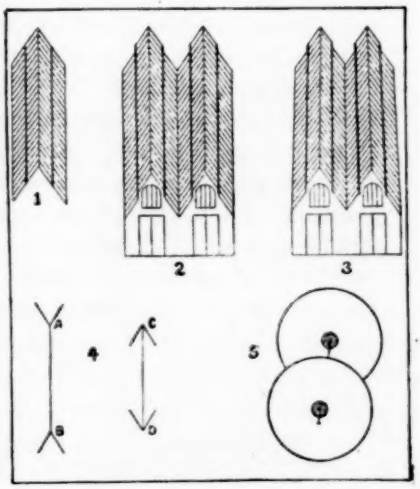
A CLASS of optical illusions in which the apparent length or position of lines in a diagram are affected by the direction or arrangement of intersecting or neighboring lines is described (*La Nature*, Paris, January 18) by Emile Javal. These illustrations have long been known, and most authorities on the subject have tried their hands at an explanation, but M. Javal's is peculiarly simple and general in its application. It may be understood from the translation of his article given below, with the accompanying figures:

"There are several optical illusions which, it seems to me, depend on a single principle, which I will explain after describing some particular cases.

"Thirty-five years ago F. Zöllner published a series of designs analogous to that of Fig. 1, and since that time numerous learned men have given explanations, the more ingenious as they have been less exact, of the remarkable phenomenon by which the two

thick lines of this design, which are rigorously parallel, appear to diverge toward the top.

" In Fig. 2 the same phenomenon appears yet more distinctly, but here there is no longer an illusion, for the designer has correctly represented a building of odd shape whose farther end is larger than that nearer the observer. A similar building of rectangular shape would be represented by Fig. 3, in which strict perspective has been observed. The spectator has then a right to say that the lines of Fig. 3 *represent* parallel lines. From this there is but one step to the assertion that they *are* parallel, and that, consequently, the similar lines of Fig. 2 are not parallel (as they are in reality). It is by an involuntary assimilation that we are led to believe that the lines of Fig. 1 are not parallel.



FIGS. 1, 2, 3.—Illusion of the Parallel Lines. FIG. 4.—Illusion Regarding the Length of the Lines. FIG. 5.—Illusion of the Circles.

"This experiment recalls to me the misadventure of an artist who, forced by an accident to stay in a country inn and finding himself out of money, proposed to pay his bill by painting a sign that should represent a diligence stopping before the door of the *Hotel de la Poste*. The innkeeper, before accepting this payment, summoned the most expert person in the village in matters of carriage-building. The man, who proved to be a wheelwright, at once placed one of the points of a pair of compasses in the center of the diligence-wheel, and with the other described a circle which differed widely from the ellipse traced by the painter, saying as he did so, 'There. Comment is quite unnecessary!' It goes without saying that the sign was refused

with disdain. It was useless to explain to the wheelwright that in perspective a circle is represented by an ellipse, and nevertheless a child would not have hesitated in looking at the picture,to say that the wheels looked round to him, and not oval.

" Every design that represents real objects in perspective must alter the dimensions of their lines and angles. The result is that, being accustomed to look at real objects, we are inclined to make corrections in the images of the mthat we receive — systematic rectifications, whose persistence explains the so-called psuedoscopy of Zöllner.

FIG. 6.—Illusion of the Vertical Lines.

" Fig. 4 shows a no less striking illusion: to assure ourselves that the lines *AB*, *CD* are exactly equal we must measure them, for one looks shorter than the other.

"Observe Fig. 6; it is difficult to believe that the lines *ab* and *cd* are precisely equal, for we know that the wardrobe is not so high as the ceiling of the room. I beg to call attention to the fact that in this picture, the extremities of the line *ab* touch lines similar to those at the extremities of the line *AB* of Fig. 4, and that there is the same analogy between the lines *CD* and *cd* of Figs. 4 and 6.

" Now it would be easy to multiply similar examples, and to remark that, when we regard the objects that surround us the arrangement *CD* is found most often for vertical lines near us, while that of *AB* appears oftenest in connection with far-off lines like *ab* and *cd* of Fig. 6. Then, in our need to know the real dimensions and not the apparent size of objects, we are in the habit of estimating the lines of the system *AB* as longer than

those of the system *CD*, and we keep up this habit when its reason for existence is no longer present, for instance, when we are looking at Fig. 4.

"Dr. Green, of St. Louis (Missouri), has called our attention to an interesting illusion shown in Fig. 5. The upper circle seems larger than the lower, and the explanation is similar to the preceding; we can not help thinking that the design represents two paper disks through which has been thrust a pin, serving as the axle of two wheels, which, if they were equal, should have been represented as unequal in the figure. This experiment of Green is more striking when instead of one design we have two, so arranged that they can be viewed through the stereoscope.

"All these optical illusions and others like them appear to me to be explicable thus:

"When lines traced on a plane are arranged similarly to those that the eye is accustomed to meet in the perspective representation of objects, the appreciation of the dimensions and positions of those lines is falsified by the habitual interpretation evoked by the lines thus arranged.

"All the illusions of which we have been speaking present the peculiarity that they disappear almost completely when illumined by an instantaneous flash. They increase, on the contrary, when the eye is allowed to dwell on them. This fact, which has long been well known, adds strength to my explanation."—*Translated for* THE LITERARY DIGEST.

Do not yield to bashfulness. Do not isolate yourself, sitting back in a corner, waiting for some one to come and talk with you. Step out, have something to say; though you may not say it very well, keep on. You will gain courage and will improve. It is as much your duty to entertain others, as theirs to amuse you.

Do not spend your time in talking scandal; you sink your own moral nature by so doing, and you are, perhaps, doing great injustice to those about whom you talk. You probably do not understand all the circumstances. Were they understood, you would. doubtless, be more lenient.

GERALD MORGAN'S THEORY.

PHOTOGRAPHY by means of flashlight under the water is by no means an impossibility, as recent experiments in France with a closed water-tight camera resulted in excellent pictures of submarine effects. But whether "Gerald Morgan's" experiment as narrated in "Sons and Fathers" would succeed is not so settled a fact, however plausible and convincing, and this is where the novelist has the advantage over ordinary mortals—it may be made in a work of fiction. Rays of light, it has long been known, affect many tissues, the best photographic results, of course, coming from the action of light upon the various sensitive plates that have been discovered and developed since the time of Daguerre, who used the salts of silver. "Gerald Morgan's" theory is that the sensitive coating of a live fish will receive impressions, and, as detailed in the story of "Sons and Fathers," he succeeded in causing a fleeting impression to appear on the side of a large bass.

And, in this connection, the question as to whether the retinal photograph can be fixed is not without interest. In spite of popular belief, there is no foundation for the idea that the retina of a dead person will retain the last impression of the living organism. Even if it did it would be so minute as to be indistinguishable; but, so far as known, the impressions made on the retina are exceedingly fleeting. One physicist, in speaking of this matter, had this to say:

"When I was a student," he said, "I tried a few experiments to see if there was anything in the 'retinal purple' theory. I used rabbits in my experiments, and did succeed in obtaining a certain result. We kept the rabbits in the dark for some time, and then, placing one of them in a black bag, brought it to a long narrow box, in one end of which was fastened a ground-glass plate. On this plate we painted black bars, making a sort of grating. The box was lined with black, so that the only light came in through the glass plate. The rabbit crouched in the box, with his eyes toward the glass. After a time it

was killed instantly, decapitated and the eyes removed, properly cut and plunged into a 'fixing' mixture. The best results showed a faint image of the black bars, but the image faded away in a very short time. It was necessary to act promptly, for a few minutes' delay made it impossible to obtain anything."

"Well, what do you think of a man who says he has photographed a shadow on a living fish by a flashlight under water?"

"I prefer dry plates above water, and not live fish, when I take photographs," said the scientist, with a smile.

Another physicist in speaking of the fish experiment said: "It hardly pays to say 'impossible' in these days. I would not like to say that, under suitable conditions, with everything favorable, such results would be beyond the range of possibilities, or even probabilities. It might be done. I am not prepared to say it might not be done."

"Have you any reason to think it is not beyond the probable?"

"No. I might say that it could be done for the same reason that a gelatine plate is affected, or, better still, for the same reason that the retina of the eye is affected. Undoubtedly the different colors and intensities of light produce different effects upon the same substance. Under such suitable conditions these effects might be held permanently and brought out so as to be seen. Those tissues that are not exposed to the light are more likely to be affected than those always in the light."

These views represent the practical view of the matter, and they leave a loophole for the author of "Sons and Fathers" and for the actuality of "Gerald Morgan's" word. The advent of the Roentgen ray has made scientific men careful as to how their skepticism expresses itself. The wonderful thing of the future soon becomes the common-place fact of our every-day lives.

Do not be unduly familiar; you merit contempt if you are. Neither should you be dogmatic in your assertions, arrogating to yourself much consequence in your opinions.

A NEGLECTED METHOD OF RETOUCHING.

THE higher artistic pretensions, says J. Gaedicke, in the *Photographisches Wochenblatt*,* with which we may endeavor to invest a photograph, the more difficult will it be found to justify the almost universal practice of retouching by means of dots and short strokes. At the present time a freer and broader treatment of the picture is required. Laborious working up easily ends in a distorted expression, and as the methods of retouching now followed are excessively laborious, the results often have a tortured, stiff and dull effect.

Photography depicts in even tones that blend with each other in the most delicate manner, and it is therefore natural that retouching should also be done in even, soft tones. In place of this, strokes and dots are used, which are crowded together in enormous quantity to present to the naked eye the appearance of even tones. This may be approximately attained in albumenized prints, but not in collodio-chloride.

It is patent that the general effect may be lost sight of in this way, because attention is concentrated upon very small areas. The loss of time, too, in brightening up large surfaces very often leads to sins of omission, and the possibilities of a better interpretation are lost.

In contrast with this, we would recommend a more general use of the stump in conjunction with powdered graphite or finely scraped lead pencil.

A paper stump is preferable to one of leather, and may be bought of any dealer in artists' materials, or they may be made of unsized paper cut in long strips and rolled up to the thickness of a lead pencil. The last layer of paper must be fastened down with fish glue or gum to prevent the stump unrolling itself. Both ends of the roll of paper are then sharpened with a penknife, which may be repeated as often as the point becomes too blunt. A broad as well as a sharp point should be prepared.

* Translated in *The British Journal of Photography.*

The stump is now dipped into the graphite and rubbed upon a sheet of paper until it is equally distributed over the point. The most delicate tones and the softest of lines can then be produced in perfect harmony with the tones of the negative. Portions of the picture that are too sharp may be moderated and made subordinate. Large areas may be brightened up in the quickest manner.

A still larger number of effects may be attained if the back of the negative is taken advantage of. To this end it is coated with a mat varnish, and the heaviest of shading can be rubbed on. By such means portions of the picture may be blocked out altogether, if occasion requires.

In retouching the film side of the negative, it is best to roughen the surface of the varnish by rubbing, or to use a retouching medium, if heavy shading is required.

The stump will be found sufficient for most of the retouching, and only for a very fine work will it be found necessary to use the pencil. Under any circumstances the stump will effect a great saving of time, and, as more attention can be given to the general effect, the stump should not be absent from any retoucher's desk.

Edison and Tesla Exchange Compliments.—During the late electrical exhibition Mr. Edison said that if Mr. Tesla had invented a light so wonderful, why not show it and demonstrate to the world by action rather than by words that the lamp was a reality and not a theory. Mr. Tesla was shown Mr. Edison's statement, and he said in reply: "I entirely agree with Mr. Edison that it is much better to act than to talk. I do, however, desire to say this: over the head of my bed in the Gilsey House hangs an incandescent lamp. I use it every night before I go to sleep, for I have the bad habit of reading after I have retired. I have never yet turned the current from this lamp without mentally expressing my gratitude to the man who made that method of lighting possible." With this bucket of hot coals for Mr. Edison. Mr. Tesla shut himself up in his workshop.

THE REPORTED PHOTOGRAPHY OF HIDDEN OBJECTS.

NO more news has been received regarding the reported use in photography, by Professor Röntgen of Würzburg University, of some form of radiation that will pass freely through certain substances that are usually opaque and will be stopped by others. No accounts of experiments have yet been contributed to the scientific journals, and the experimenter doubtless does not consider his work to be yet in such shape that it can be profitably laid before his coworkers. Meanwhile the current popular scientific periodicals comment variously on the newspaper reports. *The Scientific American* makes the following remarks:

"There have been received from Europe by cable very insufficient accounts of a discovery attributed to Professor Röntgen, of Würzburg University. By the use of a radiant state of matter tube, a Crookes tube, it is stated that he has succeeded in obtaining photographic effects through opaque objects. It has long been known that ether-waves of long period would pass through matter opaque to short waves, and that such a screen as is afforded by a plate of blackened rock salt will sift out short waves, while long waves pass through it. In some unexplained way Professor Röntgen, it is claimed, has succeeded in affecting the sensitive plate with waves which had passed through an opaque body. Metals cutting off all rays alike would produce a shadow, so that a metallic object in a box or embedded in the human system could be made to give some kind of an image. The operations are said to have been conducted without a lens, entirely by shadow.

"This is about the substance of the reports. It is yet too soon to indulge in the wild possibilities that have been suggested for the process. When the details reach us, the process will probably prove to be of scientific rather than of practical interest."

Science comments on the news in the following language:

"The Vienna *Presse*, the London *Staadard*, and other daily papers report what purports to be an extraordinary discovery by

Professor Röntgen. It is claimed that he has found that the ultra-violet rays from a Crookes vacuum-tube penetrate wood and other organic substances, whereas metals, bones, etc., are opaque to them. It is said that he has thus photographed the bones of the living body, which would be one of the most important advances that has ever been made in surgery. The photographs have been sent to Vienna and are in the hands of Professor Bolzmann, who has, it is said, accepted the discovery, though he has not succeeded in his attempt to repeat the experiment. In spite of apparently absurd statements concerning the action of the ultra-violet rays, it is not impossible that substances such as metals, which are good conductors of heat, should absorb the ultra-violet rays, while substances such as wood, which are bad conductors of heat, should transmit them. Professor Röntgen is professor of physics at Würzburg, and any experiments published by him would be accepted without hesitation."—*The Literary Digest.*

Photography of the Past.—Our esteemed contemporary, the *Practical Photographer* of London, under the able management of the new editor, Mr. Matthew Surface, is rapidly forging its way into the front rank of photographic literature. Always practical and instructive, the *Practical Photographer* with the present year has been increased in size and general appearance. The special feature for the double May number is devoted to photography of the past, illustrated with a frontispiece in two colors, four supplement pictures and ninety illustrations in the text. The photographic record consists of ten papers by different writers, on The Growth of Picture Making, Portraiture in the Sixties, The Evolution of the Accessory, The fine Lenses, A Photograph taken in 1824, The Oldest Photographic Portrait, The First Full-length Child Portrait, Some Early Work, The Early Days of Photography, and lastly, but not least, A Chronological Record of Inventions, Discoveries, etc. We congratulate Editor Surface upon the interesting and valuable data that he has given to his readers. There is not alone food for the historian and statistician, but objects for study for the professional as well, showing him the evolution of photographic portraiture during the last half century.

The Editorial Dropshutter.

The Syracuse Camera Club last month issued invitations to attend an exhibition of photographs at the art galleries of Francis Hendricks & Co., 114 E. Fayette St., Syracuse, N. Y. These photographs are the private collection made by Mr. George Timmins, to show what has been accomplished in the production of artistic pictures by photographic processes, and represents the best work of the leading artists of the world. The exhibit was open from May 25th to 30th, inclusive.

The City beside the Sea. — The Amateur Photographers' Society at Atlantic City, N. J., lately gave an interesting exhibition under the direction of State Geologist S. R. Morse. Views of Atlantic City as it appeared a score of years ago evoked much interest among the guests of the hotel. These views included ones of the first board-walk, the original life saving station, the Dennis Cottage, the beginning of the hotel of that name, which is now one of the largest in the city, and several bird's-eye views from the light-house.

[COMMUNICATED.]

WALPOLE, MASS., April 24th, 1896.

EDITOR AMERICAN JOURNAL OF PHOTOGRAPHY,

DEAR SIR: My attention has been called to the article in the April number of your journal on "The Use of Alkalies," by C. J. in *Photography*. It is quite evident that this writer is not aware that there is a crystal carbonate of soda in the market in a concentrated form, containing only eighteen per cent. of water, and not affected by atmospheric changes, one pound of which is equal to two pounds of best sal soda or washing soda, so called. We put this before the photographic trade some two years since, but we have not pushed it as we intend to, our other chemicals having absorbed our attention. This double refined carbonate of soda is a boon to the photographer, and we believe a safer alkali to use than any of those mentioned in his article. Our make is chemically pure, very cheap, and need not be kept carefully bottled for fear of deliquescence, but we strongly recommend every photographer to keep his chemicals covered on account of the danger of contamination by dust particles and the possible admixture of other chemicals in the laboratory. We take pleasure in forwarding you a sample by mail.

(Signed) HENRY D. DUPEE,
Walpole Dye & Chemical Co.

Artistic Backgrounds. — Packard Brothers, the Boston background printers, write us they will have an exhibit at the Chautauqua Convention covering about one thousand square feet of floor space. The display of artistic backgrounds and accessories by this well-known firm will no doubt prove worthy the occasion, and constitute one of the convention attractions.

Electricity and the Eye.—The question of injury to the eye from electric light is one that is being prominently discussed by scientists, oculists and laymen throughout the country. While opinion widely differs as to the ultimate injury likely to result from the rapidly increasing use of electricity, the consensus of opinion is that light from uncovered or uncolored globes is working damage to eyesight of humanity.

In a discussion of the subject a London electric light journal, in defending its trade, feels called upon to make some important admissions. It says: "It is not customary to look at the sun, and not even the most enthusiastic electrician would suggest that naked arcs and incandescent filaments were objects to be gazed at without limit. But naked arc lights are not usually placed so as to come within the line of sight, and when they do accidentally, whatever may result, the injury to the eye is quite perceptible. The filament of a glow lamp, on the other hand, is most likely to meet the eye, but a frosted bulb is an extremely simple and common way of entirely getting over that difficulty. The whole trouble can be easily remedied by the use of properly frosted or colored glass globes. In any case, however, the actual permanent injury to the eye by the glowing filament is no greater than that due to an ordinary gas flame."

The Powder Exploded.—While taking a flash-light photopraph in the store of A. C. Satterlee, 3422 Germantown avenue, Otis Wheelock, aged 28 years, of 154 North Eleventh street, was severely burned on the arms and face by the explosion of the powder he was using. The force of the explosion threw both Wheelock and his assistant out into the street, but the assistant escaped without injury.

Wheelock was taken to the drug store of M. Sonntag, 3415 Germantown avenue, and it was found that his left hand and forearm were severely burned. But for the glasses he wore it is probable that his eyesight would have been destroyed, as the glasses were black with the burnt powder, while the left side of his face was also badly burned. Mr. Sonntag dressed the injuries, and on his advice Wheelock was afterward taken to the Samaritan Hospital, where he was also treated.

Wheelock is a travelling photographer from New York city, and has been in Philadelphia for about three months plying his vacation. He stated that he usually purchases the powder for flash-light purposes by the pound, but yesterday, being out of the material, he had bought a single ounce at a store which he said he can locate, and believes that the boy who served him gave him an explosive by mistake for the powder he asked for. He stated his intention of holding the proprietor responsible for the mistake which resulted in his injuries.

How a Cat Falls —M. Marey, the well known French photo-scientist, has been studying this problem by taking sixty instantaneous photographs per second of a falling cat from different points of view. He finds that a cat always falls on its feet, providing it has a distance of a yard to fall in and enable it to make a half turn in the air, so as to get its feet undermost. It holds its paws vertically, and manages to preserve this position during the rest of the fall, in spite of the initial movement of rotation taken by its body. The mechanical explanation is simply that the animal, by thrusting forward its left limbs, shifts the centre of gravity of the whole body, so as to make it revolve upon the axis of the spine, until the feet reach the ground. An old solution of the question is that the legs of a cat are so long that when stretched out they overbalance the body. Moreover, a cat does not hurt itself by a fall from a height, not only because it invariably falls on its feet, but because the structure of a cat's back and spine is extremely flexible. The muscles of its legs, also, are extraordinarily strong and numerous, and, further, it has elastic pads or cushions consisting of a mass of fibrous tissue and fat on all its feet, seven in each fore-paw and five in each hind-paw. The cat nearly always alights on these pads, which, reason of their elasticity, break the force of the fall.

Incomes of Newspapers.—Among the most interesting figures of the recent census are those relating to newspapers and periodicals. The general impression is that the most of the incomes of these publications is from advertising, and the public will be interested in knowing that the revenue is about evenly balanced. It is as follows: From advertising, $71,543,087; from circulating, $71,343,361, the slight difference being in favor of the subscribers. The number of copies printed during a year in the United States reaches the marvelous total of 4,681,113,530, and this was an increase of two billions and six hundred millions over the figures of 1880. In the five years since the census was taken the increase has gone on, and it is safe to say that the total to-day is over six thousand millions.

The Non-Durability of Paper—Authors and artists who are raising an outcry against the impermanent papers which enter into books at the present time are making much ado about nothing. The remedy is in their own hands. If the book is worthy of living and worthy of printing, the paper should, of course, be stable. But it is a blessing in disguise if the greatest part of modern novels are printed upon paper of the ground wood kind. There is good paper and there is paper of inferior quality. Nobody capable of discriminating will have the latter for work they are careful of preserving. If the consumer will demand a quality and will pay for it, there is no excellence within the capacity of the manufacturer which is denied him. It should be the business of the buyer of paper to understand the particulars of his stock, in which case he will readily understand any failure of the product to realize his desires.

Throw away your dirty solutions, and make up a clear, clean, sweet Hypo bath once in a while, and you will see your negatives will improve.

Pure Chemicals.—The dangers to plate films, and especially to prints, arising from numerous and unknown impurities, is necessarily great; and when photographers better understand the complicated nature of most of the reactions of which they make use,—many of the apparently simplest being yet a matter of dispute,—a keener appreciation of the necessity of pure chemicals, in other words, "knowing what you are using," will come to them. Few substances are inert, that is, have no action in a mixture, and the best way to avoid undesired combinations and inter-reactions is to be sure that foreign substances are not present. This argument, according to the Walpole *Helping Hints*, would be best and fully substantiated if every user would analyze them. If one thinks a little higher price for chemicals extravagance, let him learn the proportion of his bill on the cost of his photograph (which will be found an extremely small percentage), and then ask himself if he can afford to jeopardize plates and papers costing so much more for a few cents a pound on his chemicals. 'Tis a poor economy, that.

Accuracy.—We cannot help observing the slack and lax way in which persons who have evidently abundant scientific training to teach them accuracy write us about photographs and photography by X rays. Whatever it may be called, it is agreed that it is not photography.

—*Photography* (*London.*)

Photographic Hints and Formulæ.

Combined Toning and Fixing Bath.—Dr. Vogel recommends the following combined bath as of special value for aristo and gelatine papers; it will keep and may be used repeatedly (after filtration) until exhausted:

Distilled water	400 ccm.
Hyposulphite of soda	100 g.
Sulphocyanide of ammonium	11 g.
Acetate of lead	4 g.
Powdered alum	3 g.
Citric acid	3 g.
Nitrate of lead	4 g.

This solution is allowed to stand for some days; it is then filtered and mixed with a

Solution of chloride of gold (1 to 100)	25 ccm.

The prints are toned until they assume the desired color.

Dr. Liesegang recommends the following formula:

Water	800 g.
Hyposulphite of soda	200 g.
Sulphocyanide of ammonium	25 g.
Acetate of sodium	15 g.
Saturated solution of alum	50 g.

A few cuttings of unfixed paper are placed in the solution and left to settle a few days; it is then filtered and completed with

Water	200 g.
Chloride of gold	1 g.
Chloride of ammonium	2 g.

Sulphocyanate toning baths are, according to Edward Valenta, largely used in Europe to tone aristotypes, as they work evenly, and give all gradations of tone from a violet purple to a dark blue black. Following is one of the best-known formulæ:

I.	Distilled water	1000 ccm.
	Fused acetate of sodium	40 g.
	Chloride of gold solution (1 to 100)	100 ccm.
II.	Distilled water	1000 ccm.
	Sulphocyanate of ammonium	40 g.
	Chloride of gold solution (1 to 100)	100 ccm.

These stock solutions keep for a long time if well corked, but should not be used until twenty-four hours after mixing:

For use, No. 1 . . . . . 50 ccm.
No. 2 . . . . . 50 ccm.
Distilled water . . . . . 200 ccm.

A somewhat similar formula to the above is recommended by one of the leading specialists on account of its hardening action upon the collodion films.

I. Distilled water . . . . . 800 ccm.
Sulphocyanate of ammonia . . . . . 15 "
Alum . . . . . 15 "
Carbonate of ammonium . . . . . 1 "

II. Distilled water . . . . . 600 "
Chloride of gold . . . . . 1 g.

For use, No. 1 . . . . . 100 ccm.
No. 2 . . . . . 50 "

Hydrochinon Developer for Lantern Plates.—

No. 1.—Hydrochinon Solution.

Water (distilled or boiled) warm . . . . . 10 ozs.
Sulphite of soda crystals . . . . . 1 oz.
Sulphuric acid . . . . . ½ oz.

Mix with 2 ounces of cold water, and add slowly to the sulphite solution, then add:

Hydrochinon . . . . . 100 grs.
Bromide Potass. . . . . 30 grs.
And water to make the whole measure . . . . 15 ozs.

No. 2.—Alkali Solution.

Water . . . . . 3 ozs.
Carbonate soda crystals . . . . . 1 oz.
Carb. potash . . . . . ½ oz.
Water to make the whole measure . . . . . 5 ozs.

To form developer, mix 1 part No. 2 with three parts No. 1.

Retouching Medium for Large Surfaces.—

Sandarac . . . . . 2 grs.
Ether . . . . . 7 ccm.
Gasoline . . . . . 180 ccm.

dissolve the sandarac in ether and add the gasoline gradually, shaking the bottle until all is added and combined; or,

Sandarac . . . . . 30 grs.
Castor oil . . . . . 5 grs.
Alcohol . . . . . 180 ccm.

This solution is allowed to settle, then filter.

Retouching Medium for small surfaces.—

Gum dammar	6 parts.
Gum resin	9 parts.
Oil of turpentine	120 parts.

Varnish for Retouched Negatives.—

Shellac	36 grs.
Gum mastic	7 grs.
Oil of turpentine	7 grs.
Sandarac	36 grs.
Venetian turpentine	7 grs.
Alcohol	600 ccm.

This varnish must be filtered before use. It is remarkable for its hardness, clearness and resistance.

Matt-lack for use on the glass side of a negative.

Ether	100 ccm.
Sandarac	10 grs.
Toluol	35 grs.

The sandarac is dissolved in the ether by shaking the mixture. The toluol is then added.

This *lack* is an excellent medium for use where backgrounds and skies are to be worked into a negative, as it takes both powdered color or pencil.—*G. Mercator, in Photographische Retouche.*

To Tint Aristotypes with Water Colors.—The whites of several eggs are beaten to a froth, then allowed to settle, and subsequently thinned down with water to which a little ammonia is added. The dry or mounted copies are then flowed with this medium, any surplus being drained off. When this is thoroughly dry, the print is passed through a warm burnisher, care being taken to cover the enameled surface with a sheet of white paper.

Gelatine, or Bromide Prints, may be hardened by placing in a bath of alum, chlo-aluminium, tannin or formalin.

Water Colors for Photographers.—Artists who wish to prepare their own colors for tinting photographs, whether albumen, aristotype or gelatine, will find that the so-called albumen colors will give the best results. The more permanent dry pigments are cobalt, Prussian blue, smalt-blue, starch-blue, cadmium yellow, yellow ochre, Roman ochre, verde green, Manchester yellow, Indian red, amber, burnt sienna, India ink.

The above are rubbed up with the following albumen medium:

Filtered albumen	100 ccm.
Carbonate of ammonia	5 grs.
Glycerine	3 ccm.
Ammonia liq.	4 ccm.
Water	25 ccm.

This mixture will keep almost indefinitely if well corked.

The above colors adhere well, are transparent, and may be burnished same as any albumen print.

Eikonogen Developer.—The following developer is recomended by Dr. Stiefel as giving especially fine negatives, showing softer detail than either pyro or hydrochinon.

I.	Sulphite of soda	30 parts.
	Eikonogen	16 parts.
	Citric acid	3 parts.
	Bromide potassium	2 parts.
	Water	480 parts.
II.	Sulphite of soda	100 parts.
	Carbonate of potassium	120 parts.
	Water	480 parts.

for use take

I.	4 parts
II.	1 part
Water	3 parts

Developments should be continued until the requisite density has been reached.

Matt-aristo Prints.—To impart a matt surface to the gelatine or collodion paper, according to Dr. Stiefel, it is but necessary to flow it with the following solution:

Sandarac	6 grs.
Mastic	1.25 gr.
Ether	60 grs.
Benzol	30 grs.

The matt surface may be regulated at will by the quantity of benzol used (15 to 45 grs.).

Sepia Tones on Aristo Papers.—The following formula is recommended for obtaining sepia tones on aristotye papers, and especially on solio.

STOCK SOLUTION.

Potassium chloro-platinite	5 grs.
Citric acid	40 gre.
Sodium chloride (salts)	40 grs.
Water	20 ozs.

Wash the prints from five to ten minutes, then immerse in the above bath, examining the prints by transmitted light.

Tone to a dark brown or chocolate color (not black); then, without previous washing, immerse the prints in the following bath to stop toning action.

Carbonate of soda (Walpole D. R.)	½ oz.
Water	20 oz.

Carbutt's Developing Formula for Black and White Negatives.—

No. 1.

Neutral oxalate of potash	1 pound.
Warm water (free from lime salts)	48 ozs.

Add of a strong solution of citric acid enough to just turn litmus paper red.

No. 2.

Sulphate of iron	½ pound.
Warm water	24 ozs.
Sulphuric acid	15 drops.

No. 3.—RESTRAINER.

Bromide of potassium	½ oz.
Water	10 ozs.

To develop: To 5 ounces of No. 1 add 1 ounce of No. 2 and 10 drops of No. 3.

To get an even-developed plate use sufficient developer to well cover the plate, allow to act until, on looking through, the image appears quite dense; then wash and place in clearing bath one or two minutes.

No. 4.—CLEARING BATH.

Water	20 ozs.
Alum	1 oz.
Citric acid	¼ oz.

Again wash and immerse in fixing bath.

No. 5 Fixing Bath.

Water	6 ozs.
Sulphite of soda	2 ozs.
Water	2 ozs.
Sulphuric acid	1 drachm.
Water	48 ozs.
Hyposulphite of soda	1 pound.
Water	8 ozs.
Chrome alum	1 oz.

Dissolve in the order given, add the solution of sulphuric acid to the sulphite of soda, add this to the hyposulphite, and finally add the solution of chrome alum.

No. 6.—Reducing Solution.

Ferricyanide of potassium	50 grs.
Water	10 ozs.

No. 7.—Bleaching Solution.

Bichloride of Mercury	240 grs.
Chloride of ammonium	240 grs.
Distilled water	20 ozs.

No. 8.—Sulphite of Soda Solution.

Sulphite soda	1 oz.
Water	9 ozs.

A One Solution Intensifier.—Prepare a saturated solution of bichromate of mercury in water, and pour of this a sufficient quantity gradually into a solution of

Iodide of potassium	1 ¼ ozs.
Water	6 ozs.

until the point is reached when the forming red precipitate will no longer dissolve by shaking; but be careful not to add more mercury than just enough to make the solution very slightly turbid. Now add

Hyposulphite of soda	1 oz.

Dissolve, and add water to make twenty ounces of solution. For use this should be diluted with about three parts of water. If the plate has not been thoroughly fixed the intensifying solution will produce yellow stains. Be careful not to overdo the intensifying. Should it have gone too far, the negative can be reduced by placing it in the fixing bath for a short time.

To Clean Negatives Stained by Silver. — Take a plug of cotton wool and well wet it with a weak solution of cyanide of potassium, rub gently all over the negative, using a little more force on the stained parts. Wash well; dry on blotting paper. If necessary to re-varnish, flood the plate once or twice with methylated spirit. Let dry, and then varnish in the ordinary way.

Backing Plates.—Any subject is rendered better on a backed than on an unbacked plate. Perhaps many do not back their plates, because they fancy the operation is a troublesome and messy one. Let them try the following: To make the backing mixture, dissolve 1 ounce of caramel in 2 ounces of water, add 1 ounce of finely ground burnt sienna and then 2 ounces of methylated spirit. Shake before using. Apply a thin film to the back of the plate by dabbing with a sponge dipped in the mixture. The backing will dry in a minute or two, and the crispness of negatives obtained on such plates will come as a pleasant surprise to those who have never made the experiment. Never expose an unbacked plate again.—*Photo. News.*

Thiocarbamid. — Dr. Eder publishes the results of experiments with thiocarbamid in connection with fixing, and finds that it acts as a preventive against yellow negatives. A pyro-developed negative covered with green fog was immersed in the following solution:

Thiocarbamid	10 parts.
Citric acid	10 "
Water	1000 "

In a short time the yellowish-green color disappeared. If thiocarbamid is added to the fixing bath it prevents the formation of green fog on the plates and bromide papers; but the bath must be acid.

The following formula is recommended:

Hypo	200 parts.
Thiocarbamid	10 to 15 parts.
Water	1000 parts.

To this is added 50 parts of bisulphite of soda. Both plates and papers must be thoroughly washed before fixing in this solution.

A niggardly use of Hypo is foolish economy. It is the cheapest article a photographer uses, and the loss entailed on plates and papers from dirty, brown or yellow Hypo baths, may be many times greater than the cost of a new bath would have been in the beginning.

Clearing Solution.—To remove yellow stains caused by developer.

Sulphate of iron	3 ozs. or 90 gms.
Sulphuric acid	1 oz. or 30 c. c.
Alum	1 oz. or 30 grs.
Water	20 ozs. or 600 c. c.

First wash well to remove all Hypo from the negative, then immerse in the above solution until the stain is removed; again wash well and dry.

Hypo Baths in Warm Weather.—In warm weather the Hypo bath is apt to be troublesome. It rapidly evaporates, changes color, and stains the negatives, and often acts deleteriously on the gelatine film. I add to my bath chrome alum and acid sulphite of soda. The bath now not only remains quite clear and clean, but clears and hardens the negative, making washing easier, in that the tendency to frill is minimized. The bath may be kept for several weeks; indeed it may be used until it changes from a bright green color to a brownish tint. Of course, in very warm weather the bath should be kept cold by standing the tray containing it in a pan of ice-water an hour or so before development is commenced. The bath I prefer is made up as follows:

Hypo	4 ozs.
Chrome alum	¼ oz.
Acid sulphite of soda	½ oz.
Water	1 qt.

Dissolve the Hypo, add the chrome alum, then filter and add the acid sulphite. Evaporation of the bath is prevented by keeping the dish covered when not in use.—*Helping Hints.*

Glazing Gelatine Prints.—Many amateurs are troubled by having their prints adhere very firmly to the glasses to which they have been squeegeed for glossing. In some cases this is caused by putting them on the side of the glass which was not prepared for them. To remedy this, paint a large B with Brunswick black on the back of the glass. This will ensure the same side always being used. Pieces of paper put on for this purpose are often washed off. To clean the glasses thoroughly, take a few drops of a solution made by dissolving 30 grains spermaceti wax in five ounces of benzine, and rub it all over the glass with a piece of paper nntil the surface is polished. Repeat this every time the glass is used.—*Photo. News.*

Roentgen Ray Notes.

X Rays Cannot Be Polarized.—Experiments performed by Professor Ogden N. Rood, of Columbia College, seem to show that the Roentgen rays are incapable of polarization.

An Aluminium Fluoroscope.—A new fluoroscope, in which the crystals of tungstate of calcium are spread upon a plate aluminum of instead of on cardboard as heretofore, is claimed to give much better definition to the images formed on it.

Magnesium Produces Phosphorescent Effects.—While conducting some X ray experiments recently, a fluorescent screen was observed to fluoresce on the ignition of some magnesium tape, such as is used for flash-light photographic pictures. When the tape ceased to burn, the fluorescence was observed to be quite intense. "Is there an element of the X rays in fluorescent substances, and to what degree may they be employed advantageously?"

The Penetrative Power of the Rays.—J. T. Lawrence and W. C. Cooke, of Stamford Hill, (London, Eng.), whilst experimenting with the X rays, have found that it is possible to radiograph objects in duplicate or triplicate by placing two or three celluloid films one above the other, the celluloid being practically transparent to the X rays. They also find the film to be slightly less transparent than the celluloid. Extra rapid films have been found to give the best results.

Inventors and Claimants.—Mr. Max Osterberg, a Fellow of Columbia College, delivered a lecture before the New York Electrical Society recently, and brought out the point that Prof. Roentgen in his original paper describes the principle of the so-called cryptoscope, which is now claimed by, or for, several Americans as their invention. He also established the fact that Crookes and Spottiswood some years ago announced the fact that the vacuum in a tube is actually improved by the effect of the oscillatory discharge which takes place through it. This was somewhat before Mr. Edison's observations on the same head, and, of course, also of others of recent date. Mr. Osterberg believes that this improvement in the vacuum is due to the presence of electrodes within the tube, as he found that if external electrodes are used no such increase of vacuum takes place.

Are X Rays Minute Sound Waves?—Mr. Edison has been led to believe from experiment that the phenomena are due to sound waves. Features of photographs he has recently taken cannot be explained, he thinks, except on the theory that the X ray was a sound wave of very small length, and that the shadows were sound shadows. Acting on the Le Conte theory of the transmission of sound waves, Mr. Edison began experiments. "The fluorescent bulb was placed on one side of a steel plate," Mr. Edison writes, "the observer being on the opposite side. When the fluoroscope was placed against the steel plate directly opposite the bulb on the other side no light was observed, but when the fluoroscope was made to approach within six inches of the edge, and well within the shadows, it lighted up. The direction of the X ray was found by a moving bar of iron, so as to obtain the sharpest image."

In confirmation of his theory Mr. Edison says that liquids do not fluoresce with the ray, so far as he has tried them. Only crystals fluoresce, except in a few cases, such as precipitates. The crystal is resonant to the wave. Mr. Edison continues: "A tube with a vacuum so low as to give striæ, and from which ordinarily the X ray cannot be obtained, no matter how long a dry plate be exposed to it, can be made to give the ray by a powerful blast of air on the spark of the brake-wheel of the primary, and a spark gap in the secondary, the wires of which are guarded up to the very end. The sharpness of the shadow depends on the abruptness of the brake. A very weak bulb may be made to give sharper shadows than one giving twice the luminosity in the fluoroscope, which has a connection with this theory."

X Rays Can Be Seen.—Dr. Brandes, of the University of Halle, has succeeded in rendering directly visible the X rays discovered by Prof. Roentgen. The observation made by Prof. Salvioni, an Italian physicist, that lenses are in a very slight degree penetrable by Roentgen rays, suggested to Dr. Brandes the idea that the invisibility might be due to circumstances connected with this fact. He accordingly resolved to test the effect of Roentgen rays on lenseless eyes.

There are many people who have had the lenses of their eyes removed as a remedy for extreme shortsightedness or for cataract. A girl who had had this operation performed on both eyes, but in whose right eye a remnant of the lens had been left, allowed the experiment to be tried upon her.

Professor Dorn, whom Dr. Brandes had interested in the investigation,

subjected the girl quite unexpectedly to the rays, and when the strong current passed through the tube, which had been totally darkened, she declared she saw light with her left eye. Professor Dorn and Brandes at first thought it possible that a spark had leaped across, but when this had been rendered impossible the girl continued to declare that she saw light.

On further trying the experiment the two savants saw the light, too. They continued their investigations, and ascertained that Roentgen's rays really affect the retina. If we place our head, completely inclosed in an entirely opaque vessel, near the source of the rays, we see light even with the closed eyes, and we see it most clearly at the periphery. Moreover we continue to see it even when a large aluminum plate, which would completely exclude electric rays, is placed between a Hittorf tube and the eye. Utter darkness, on the other hand, results if a thick pane of glass, which, as is well known, is only in a very slight degree peneable by Roentgen's rays, is placed between the tube and the closed or covered eye.

Herren Dorn and Brandes hope to ascertain by further experiments whether Roentgen's rays directly affect the nervous parts of the eye, or whether they only render parts of the interior of the eye fluorescent, and thus indirectly create the impression of light.

X Rays Anodic. — Professor Rowland, of Johns Hopkins University, and Elihu Thomson, both appear as enunciators and upholders of the hypothesis that X rays are of the anodic order, and not of the cathodic order. Thomson found that no X ray effect could be obtained from an excited tube when the anode and a fluorescent screen had a patch of opaque metal interposed upon the glass of the tube between them, although the cathode was unscreened. Anode rays he found to be erratic in distribution from the anode, and to require very high exhaustion for their production. He says that it is fortunate for science that the Crookes tube used by Roentgen had a high enough vacuum to give anodic rays.

Snap Shots With X Rays.—A man's body radiographed in one minute—rapid progress in the new science.—No science has ever made so rapid progress as that of radiography. It is but a few months since the announcement of Professor Roentgen's discovery of the X or unknown rays, whose remarkable properties were so contrary to human experience that nearly everybody doubted the possibility of such a

discovery; to-day the subject is so familiar to everyone that the most wonderful advances made by the many bright investigators hardly create a ripple of excitement. It is, however, important to record in the interest of an accurate chronology of the history of this science, that Professor Arthur W. Goodspeed, of the University of Pennsylvania, on Monday produced a perfectly clear radiograph of the upper portion of the body of a man, showing the ribs, shoulder joints, collar bones, and an excrescence growing upon the vertebræ of the subject, with the exposure of only one minute. Nothing approximating this speed has ever been done before with any portion of the body. It is barely two weeks since Professor Goodspeed radiographed the same portion of his own body with an exposure of forty-five minutes, which was then considered remarkably quick time.

The apparatus used in Monday's case was more powerful than that in former cases. Hitherto an induction coil affording a spark ten inches long has been used. This was changed for a coil giving a sixteen-inch spark. It is a Ritchie coil, made over thirty years ago. The current employed in the primary was about three amperes. The tube is an old one, made fifteen years ago, of German glass. It has been recently exhausted and has been in service about three weeks. The German glass, which has no lead in it, produces the best results.

Professor Goodspeed first looked through his subject with the fluoroscope, and saw the bones so clearly that he felt certain a short exposure would be required, and so shut off the current in one minute. The plate used was one of Carbutt's, the same as in the former experiments. Professor Goodspeed has radiographed so many cases sent to him by the leading surgeons of the city that he has learned what conditions are necessary to produce the best results, and how to secure those conditions. The pictures produced are marvels of clearness.

Only One of the Kind.—"You say he is a remarkable man?"

"Very."

"In what way?"

"He's the only scientist in the country who has not made an important discovery relative to X rays."

In spite of Roentgen rays, patent medicines, faith cures and all the schools and scientists, Charles Broadway Rouse, of New York, offers $1,000,000 to have his failing eyesight restored, and nobody claims the money.

(COMMUNICATED.)

ST. LOUIS, June 1st, 1896.

TO THE FRATERNITY:

The destructive tornado, which visited St. Louis on the evening of May 27th, carrying ruin and desolation in its path, took off part of the roof of our factory, and the rain, pouring through the opening, damaged a considerable portion of our stock. Fortunately no one on our premises was either killed or injured. We are having repairs made with all possible dispatch, and as our machinery and plant are still in good order, we expect to be in shape to resume work in a few days, and take this method of publicly thanking the many kind friends who have inquired in regard to our safety and have extended their sympathy.

Yours truly,

G. CRAMER DRY PLATE WORKS.

Obituary. — Colonel Vincent Meigs Wilcox, President of the E. & H. T. Anthony Company, died at his home, No. 1050 Lexington Avenue, on Saturday evening, May 9th, from paralysis of the heart. He was born in Madison, New Haven County, Conn., October 17th, 1828, and belonged to one of the oldest New England families. The annals of Bury St. Edmonds, in the County of Suffolk, England, show that the Wilcox family lived in that county even before the Norman conquest. William Wilcox, a lineal descent of Sir John Wilcox, settled in Stratford, Conn., in 1639. Colonel Wilcox's maternal grandmother was Miss Mary Field Meigs, sister of Dr. David Field, and daughter of Timothy Field, a distinguished officer in the Revolutionary War, from whom descended also the late Cyrus W. and David Dudley Field.

Colonel Wilcox was educated at Lee's Academy, in his native place, and taught school for several years. He afterwards became a merchant. In 1860 he went to Scranton, Pa., and engaged in business.

When the war broke out, he organized a company of the 123d Regiment, Pennsylvania Volunteers, which was immediately ordered to the front. He was made Lieutenant-Colonel, and his brilliant record as a soldier was mentioned in the history of the war written by Generals McClellan and Palfrey. He distinguished himself at the battle of Antietam, and when Colonel Oakford fell he took command

of the regiment. He was promoted to the full colonelcy, his commission being dated from the time of the battle. He was taken seriously ill soon after, and, before he had fully recovered, again offered his services, but the surgeon refused to pass him, and he was compelled to retire from active field work.

Colonel Wilcox then accepted a position with E. & H. T. Anthony & Co., of New York. In 1870 he was made a partner in the firm, and whan it was formed into a corporation he was made Secretary, Vice-President and President successively. He was a man of fine physique and an excellent speaker, and many of his addresses to his old regiment have been published.

Colonel Wilcox was an elder in the Phillips Presbyterian Church, Madison Avenue and Seventy-third Street, and one of the executive committee of the Presbyterian Union. He was also a Companion of the Loyal Legion of the United States, and a member of Lafayette Post, G. A. R.

In 1855 Colonel Wilcox married Miss Catherine Millicent Webb, daughter of Dr. Reynolds Webb. She died in 1860, and he afterwards married Miss Martha F. Dowd, who died in 1873. In 1875 he married Miss Elizabeth Bogart Wells, who, with two sons, survives him. One of the sons is Dr. Reynolds Webb Wilcox, well known as a physician and lecturer. There are also living his brother, Capt. Charles M. Wilcox, and two sisters, Mrs. E. J. Bishop, of Madison, Conn., and Mrs. Walter S. Mungery, of Watertown, Conn. The funeral was held May 12th, at 11 o'clock, in the Phillips Presbyterian Church. The burial was at Madison, Conn.

It Never Pays.—To run in debt for luxuries.

To cherish a fault-finding spirit.

To starve the soul to feed the body.

To marry for money or social position.

To do wrong with the hope that good may come.

To rob the stomach to put fine clothes on the back.

To make professions that we do not intend to live up to.

To do in private what you would be ashamed to do in public.

To send children into the street to secure quiet in the parlor.

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